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Relative Metal Concentrations in Amyloid Plaques of Alzheimer's Disease, as Determined by Synchrotron X-ray Fluorescence

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Beamline(s): X26A

Introduction: Alzheimer's disease amyloid plaques have previously been identified as containing higher metal concentrations than surrounding tissue [1]. However, the distribution of metals within plaques has not been mapped. Synchrotron X-Ray fluorescence allows the measurement of metal distributions within biological tissue. Preliminary analyses of metal concentrations and distribution within plaques of different morphologies are reported here.

Methods and Materials: Post-mortem human brain slices were obtained from stage 6 Alzheimer's disease patients. Tissue was fresh, unfixed, and sectioned to 20μm thickness. X- ray synchrotron fluorescence was used to examine the distribution of metals within the tissue. Potassium, iron, copper and zinc levels were examined in different types of amyloid deposits: a congophilic vascular amyloid region and two diffuse plaques. Copper and zinc levels were also measured in a dense core plaque; levels for all metals were also measured in non-plaque tissue.

Results: Iron levels were ~3 x background in all cases, although the concentration in the center of the diffuse core plaque (3.9 x background) was greater than in the periphery (3.1 x background). Both zinc and potassium levels were ~ 5 x higher than background in the center of the vascular amyloid region, and zinc levels were also ~ 5 x background in the center of the dense core plaque (see Fig 1). Potassium and zinc levels in the periphery of the region were 1.9 and 1.6 x background, respectively. Copper levels were 1.3 x background in all regions of the vascular and diffuse plaques, but were ~ 4 x background in the center of the dense core plaque (see Fig 1).

Conclusions: These preliminary data indicate that metals vary not only within plaques, but also across plaque types.

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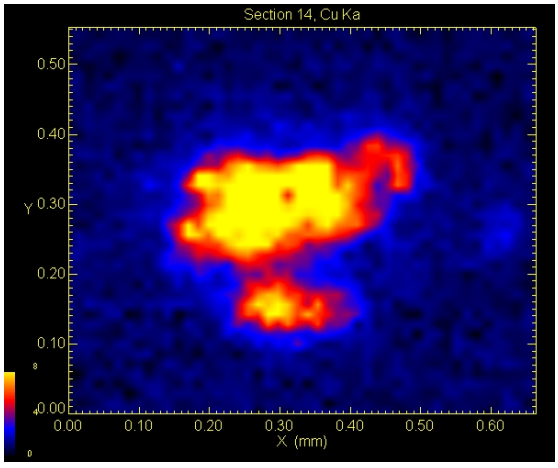
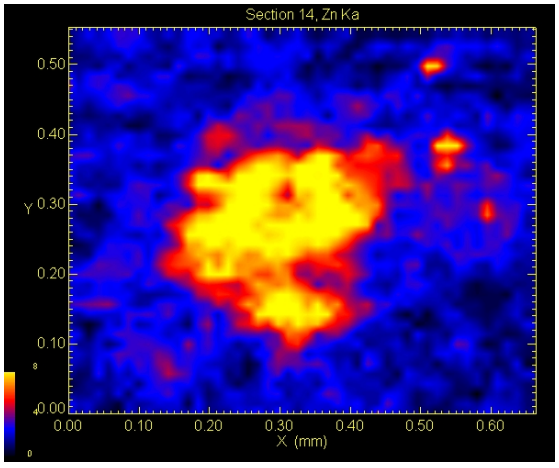
References:

[1]. M.A. Lovell, J.D. Robertson, W.J. Teesdale, J.L. Campbell, and W.R. Markesbery, "Copper, iron and zinc in Alzheimer's disease senile plaques," *J. Neurol. Science,* **158** (1), 47-52 (1998).



Dense Core Plaque: Cu



Dense Core Plaque: Zn

Figure 1